OIPE JC163
AUG 0 3 2004
PATENT & TRADEMARK OFFICE

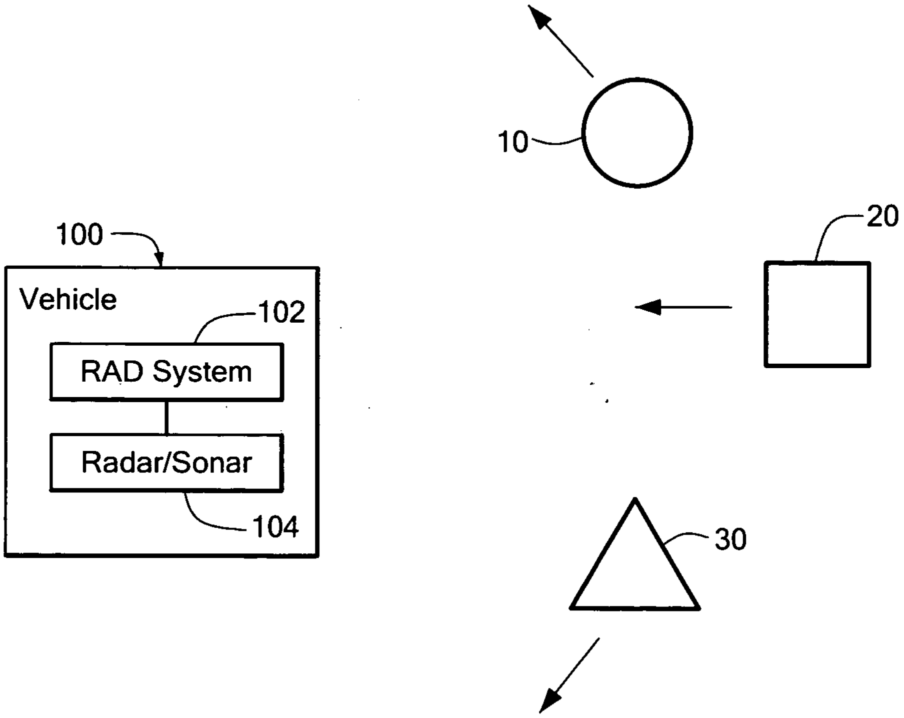

FIG. 1

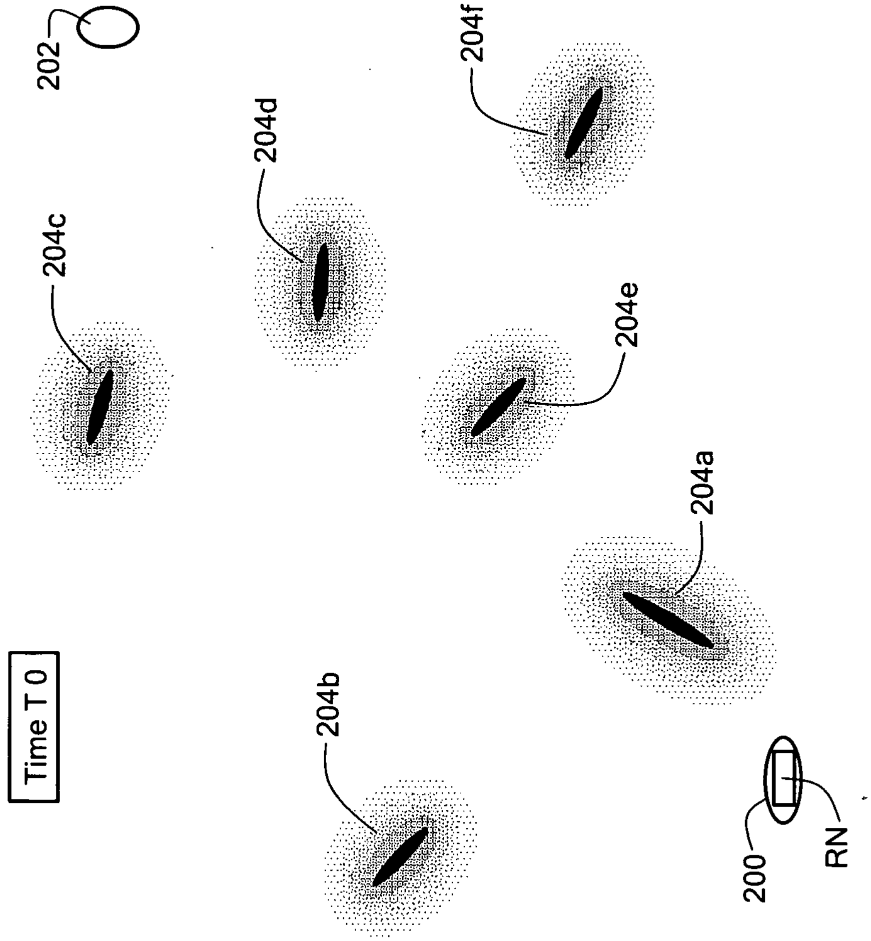

FIG. 2A

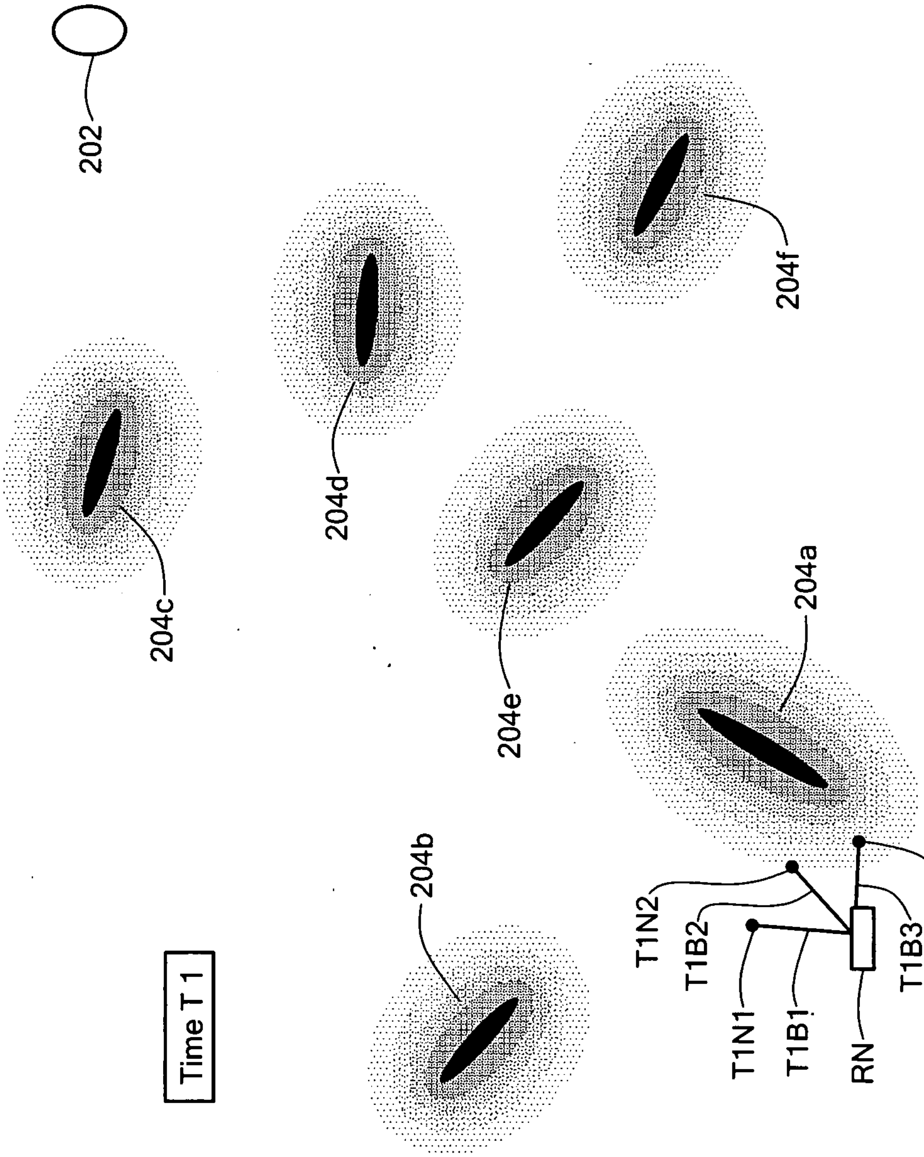
202
204f
204d
204c
204e
204a
204b
Time T 1
T1N2
T1B2
T1N1
T1B1
RN
T1B3
T1N3

FIG. 2B

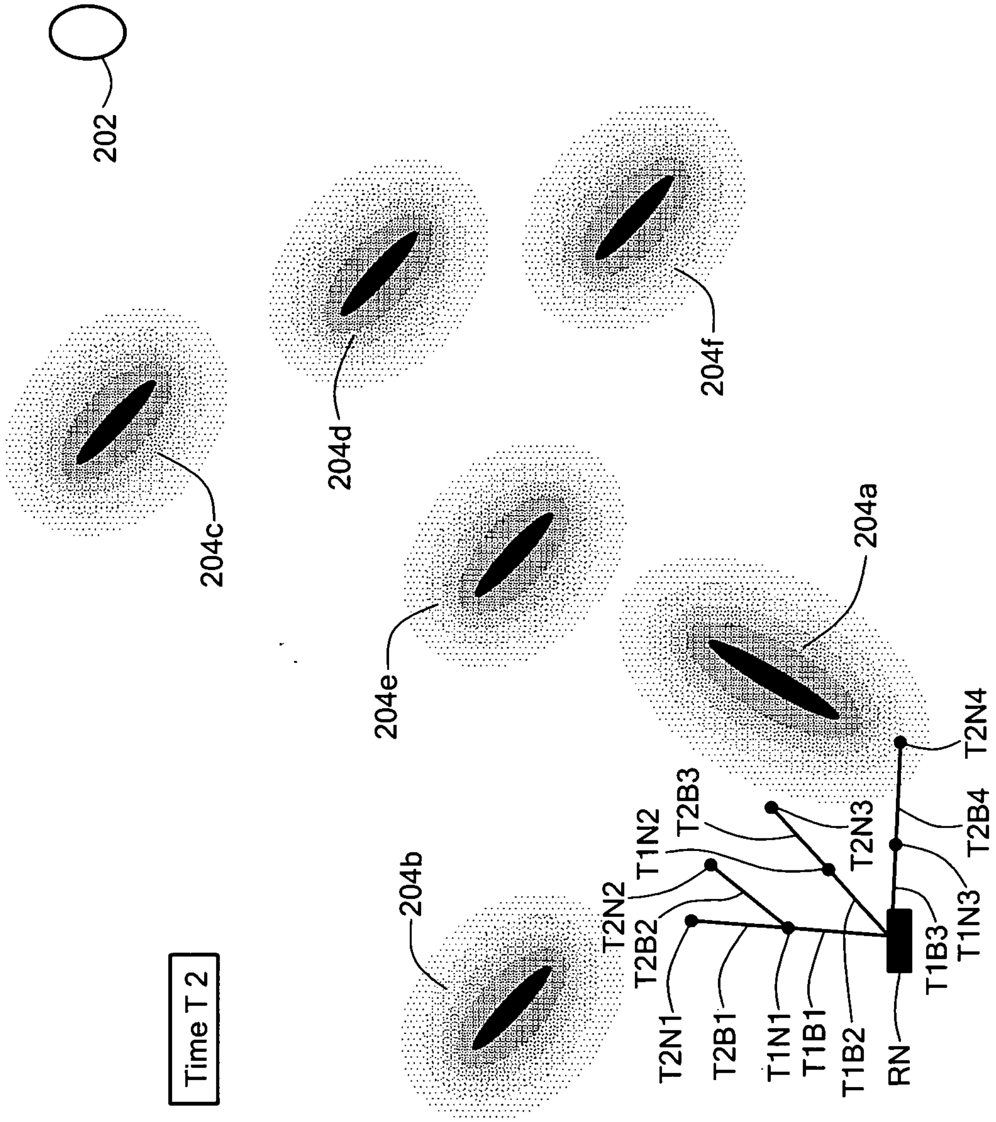
202
204c
204d
204f
204e
204a
204b
Time T 2
T2N4
T2B4
T1N3
T1B3
RN
T2B3
T2N3
T1N2
T1B2
T2N2
T2B2
T2N1
T2B1
T1N1
T1B1

FIG. 2C

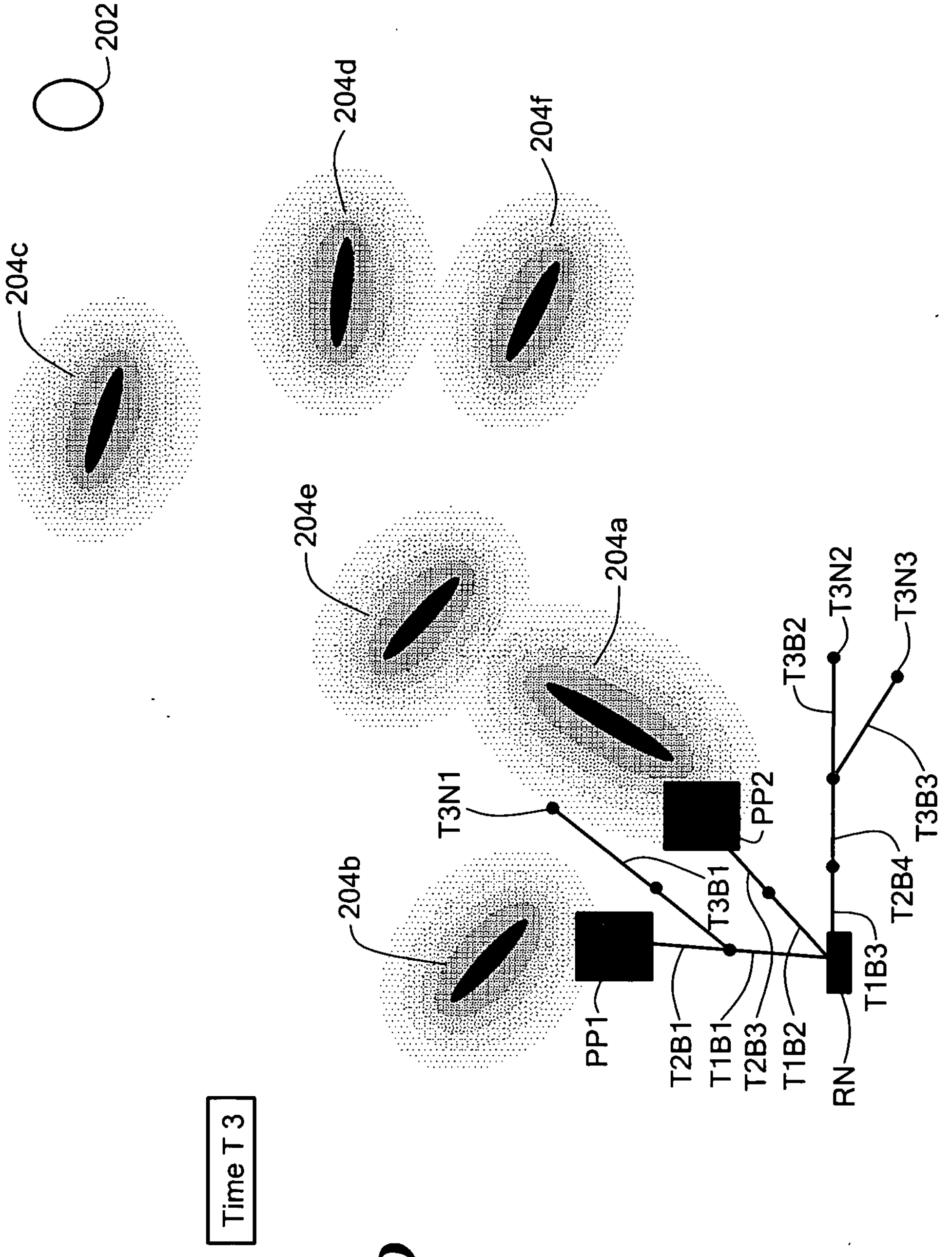
202
204c
204d
204f
204e
204a
204b
T3N1
T3B1
PP2
PP1
T2B1
T1B1
T2B3
T1B2
RN
T1B3
T2B4
T3B3
T3B2
T3N2
T3N3
Time T 3

FIG. 2D

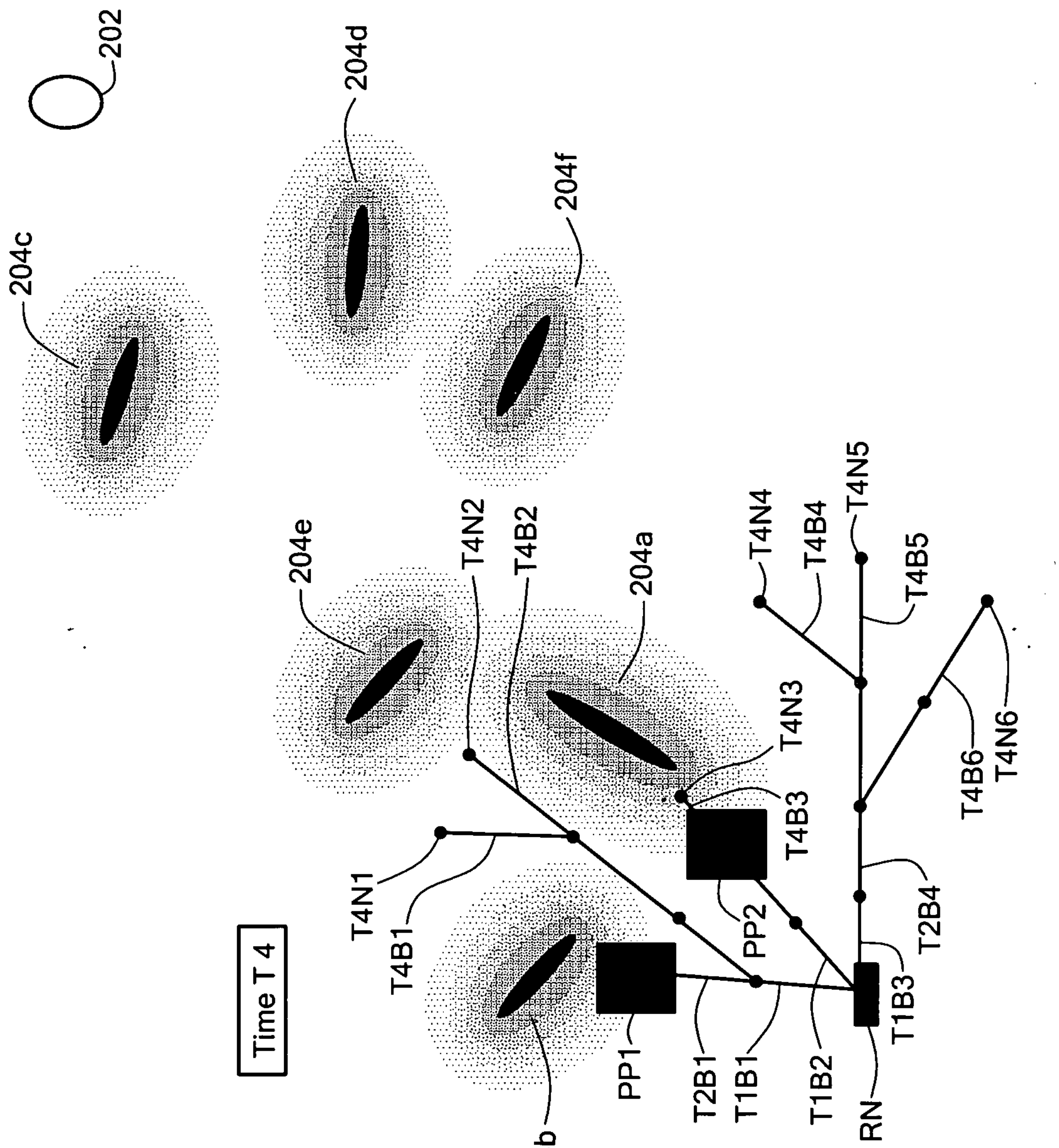
202
204c
204d
204f
204e
204a
204b
T4N2
T4B2
T4N4
T4B4
T4N5
T4B5
T4N3
T4B3
T4N1
T4B1
PP2
T2B4
T4B6
T4N6
Time T 4
PP1
T2B1
T1B1
T1B2
RN
T1B3

FIG. 2E

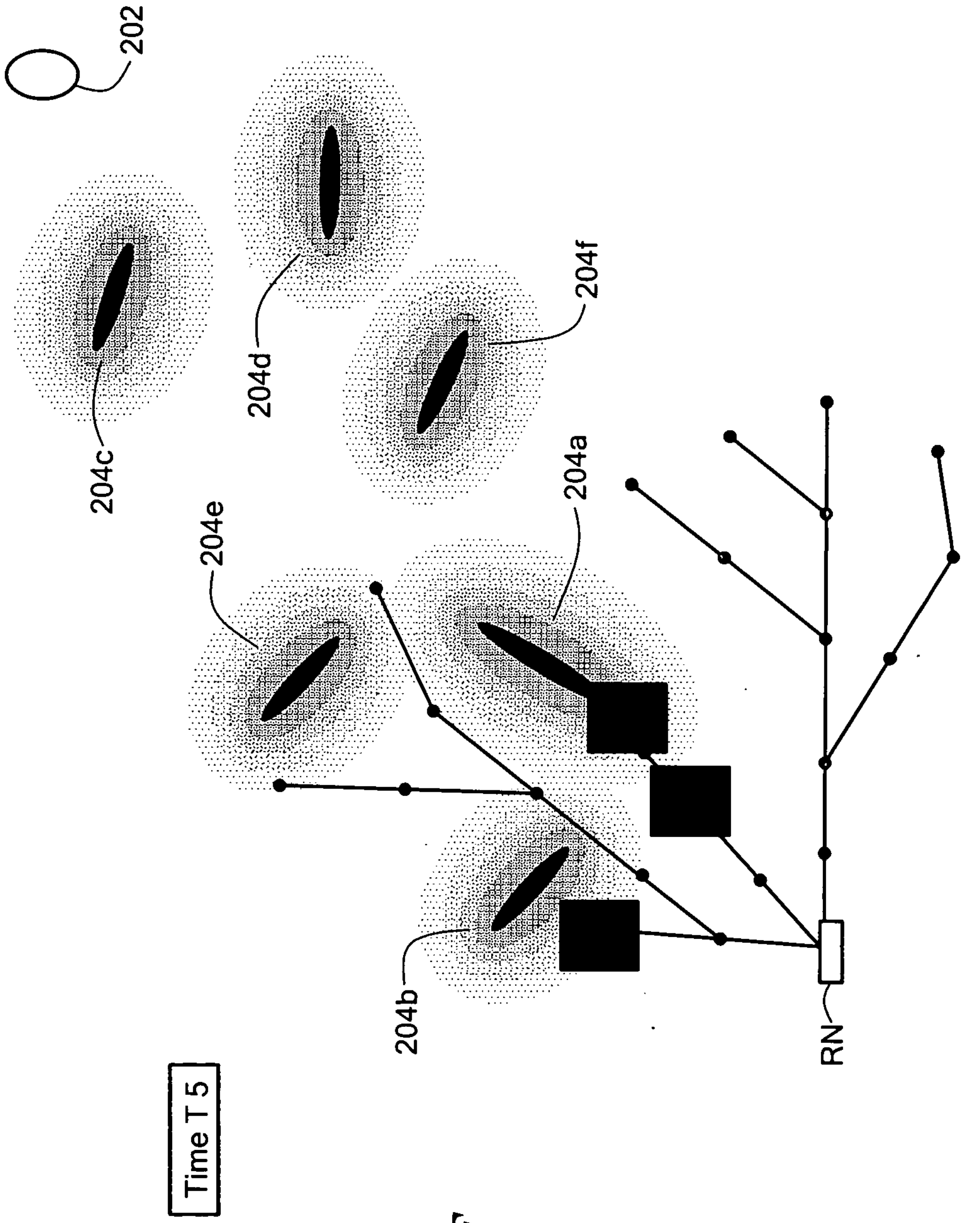

FIG. 2F

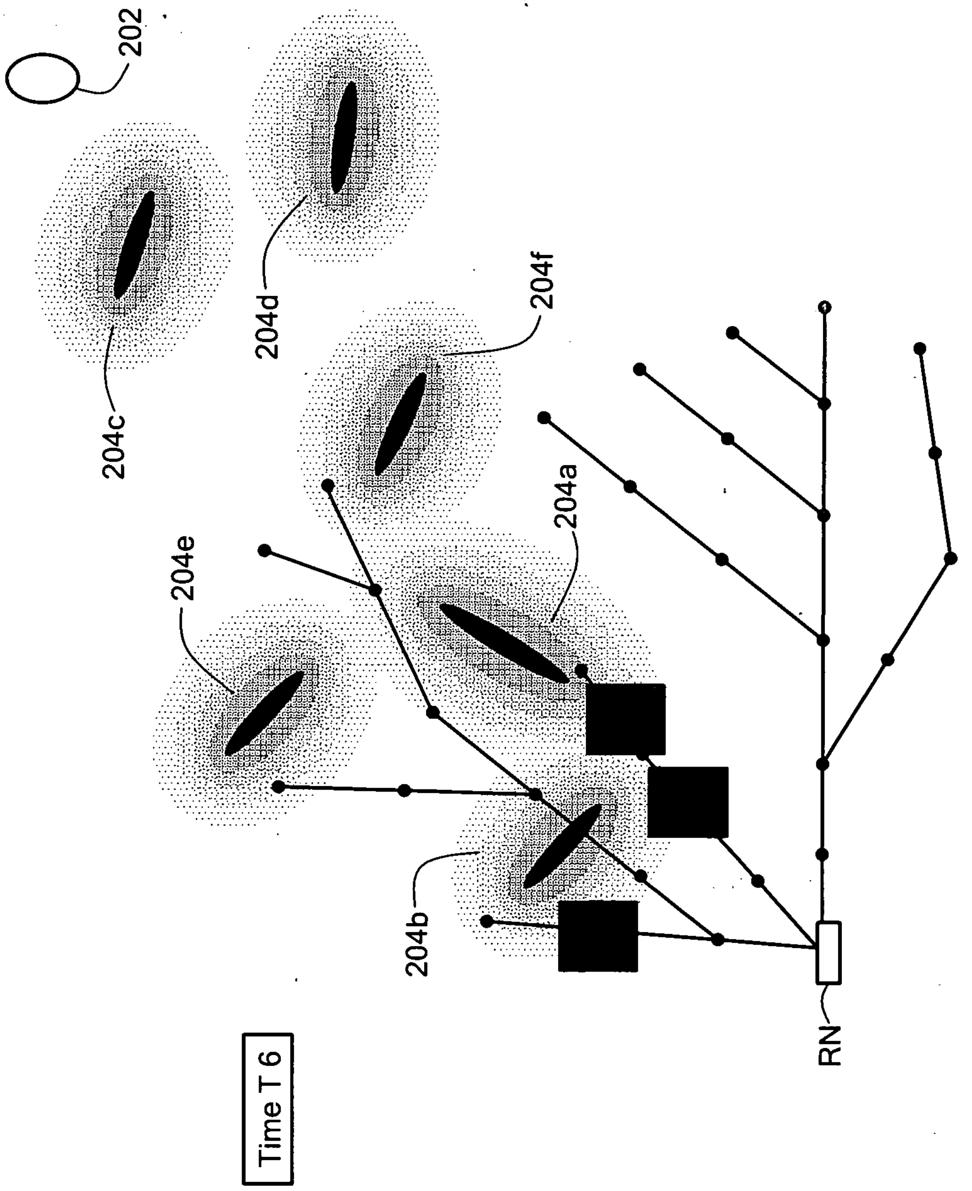

FIG. 2G

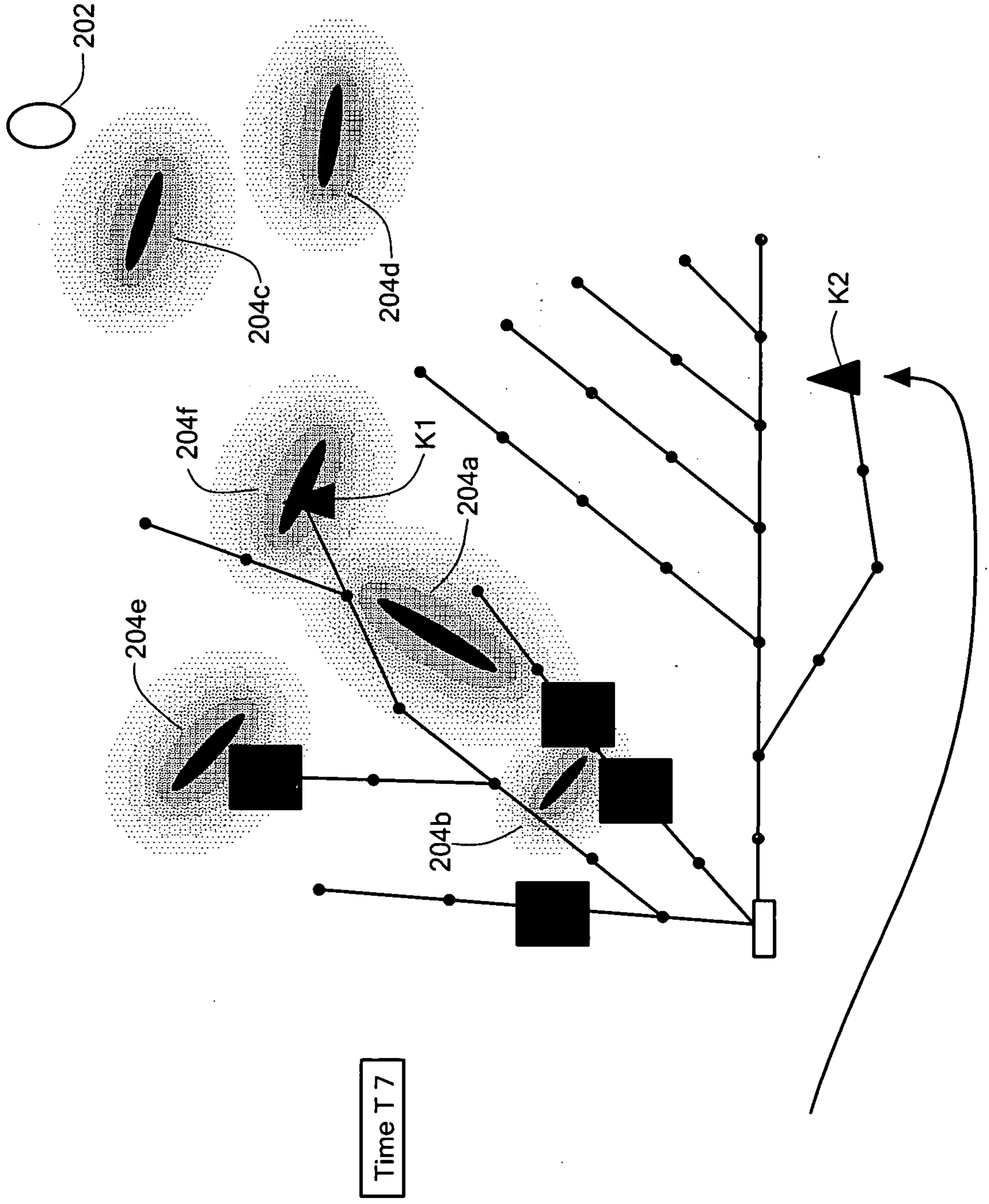

FIG. 2H

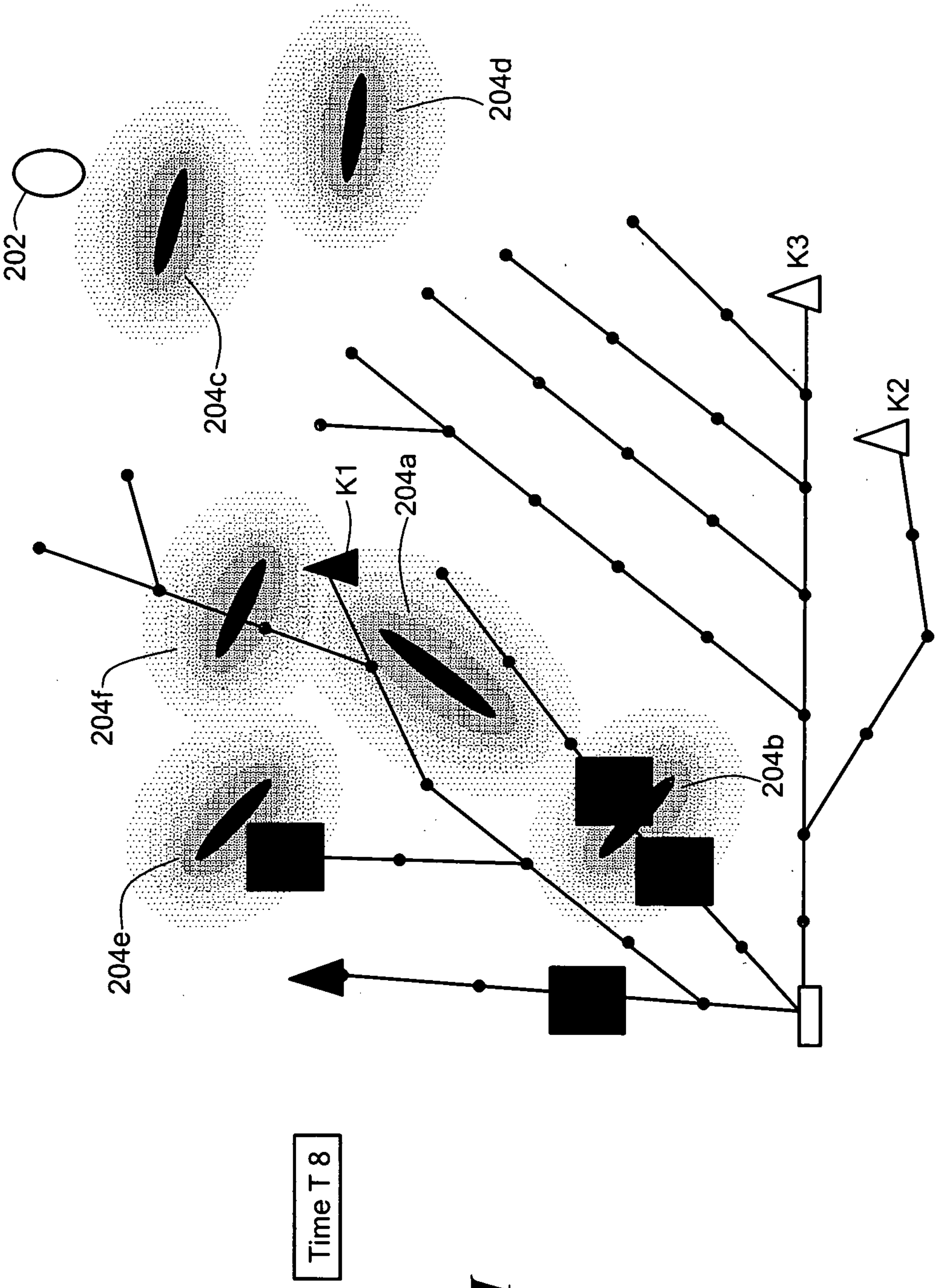

FIG. 2I

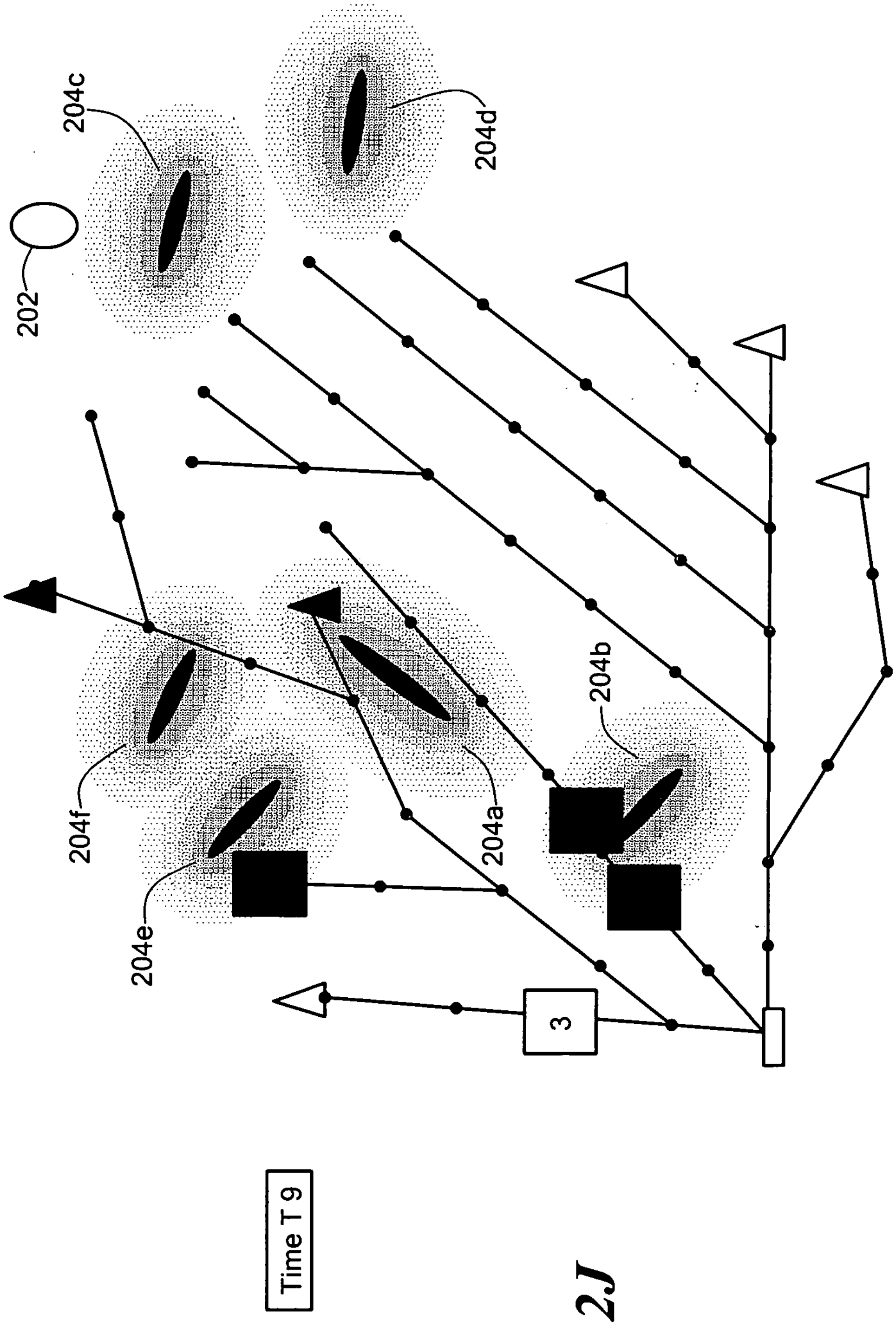

FIG. 2J

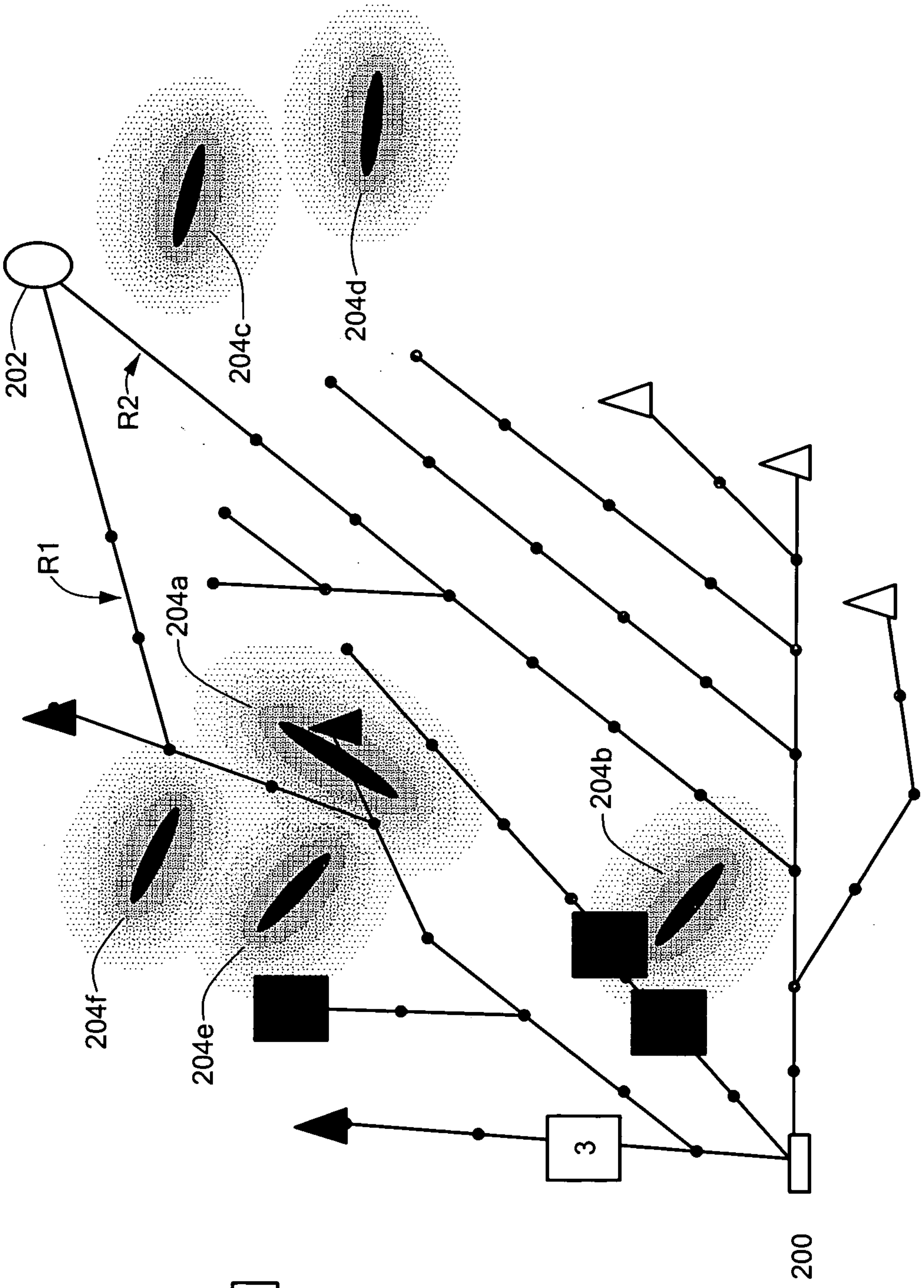

FIG. 2K

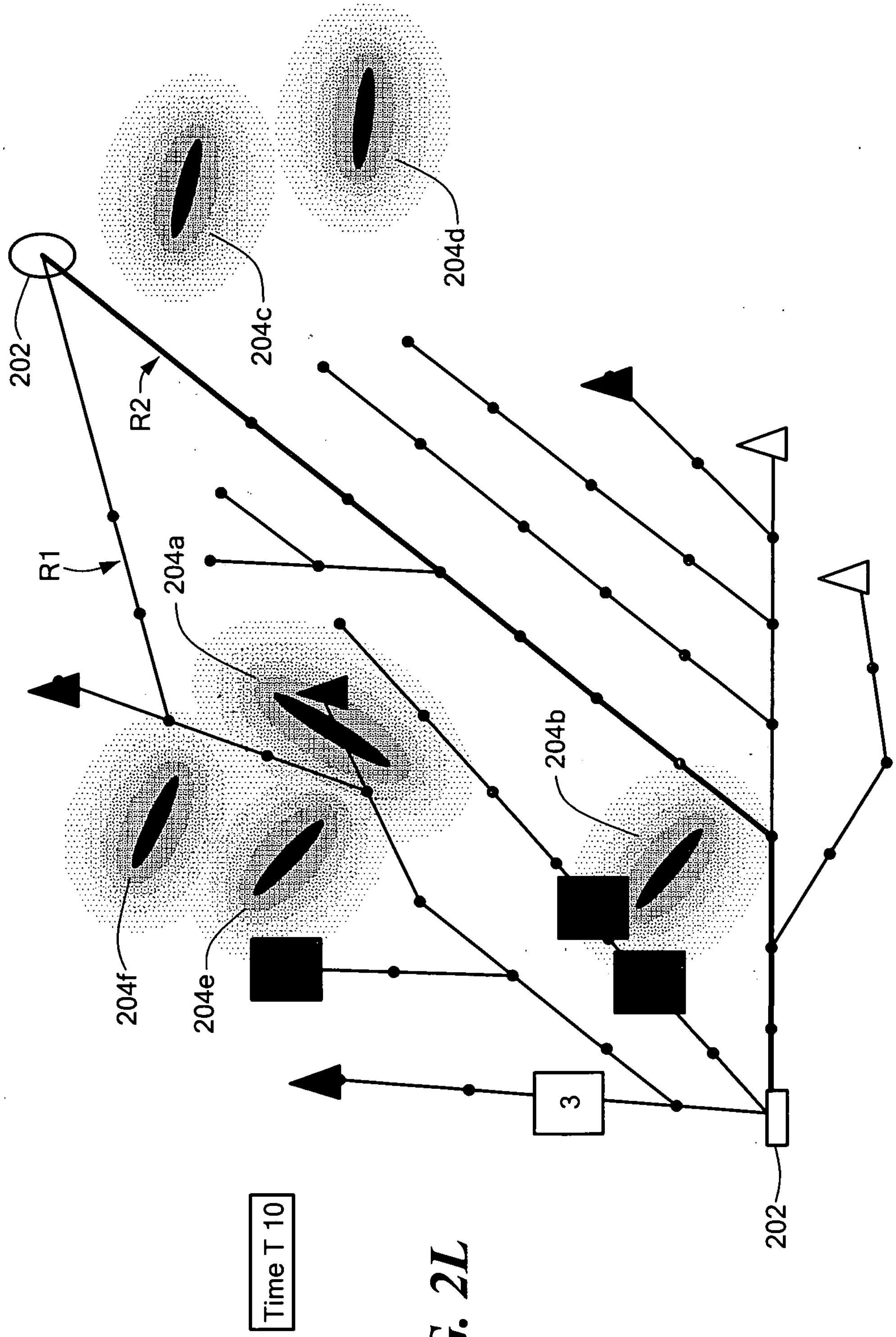

FIG. 2L

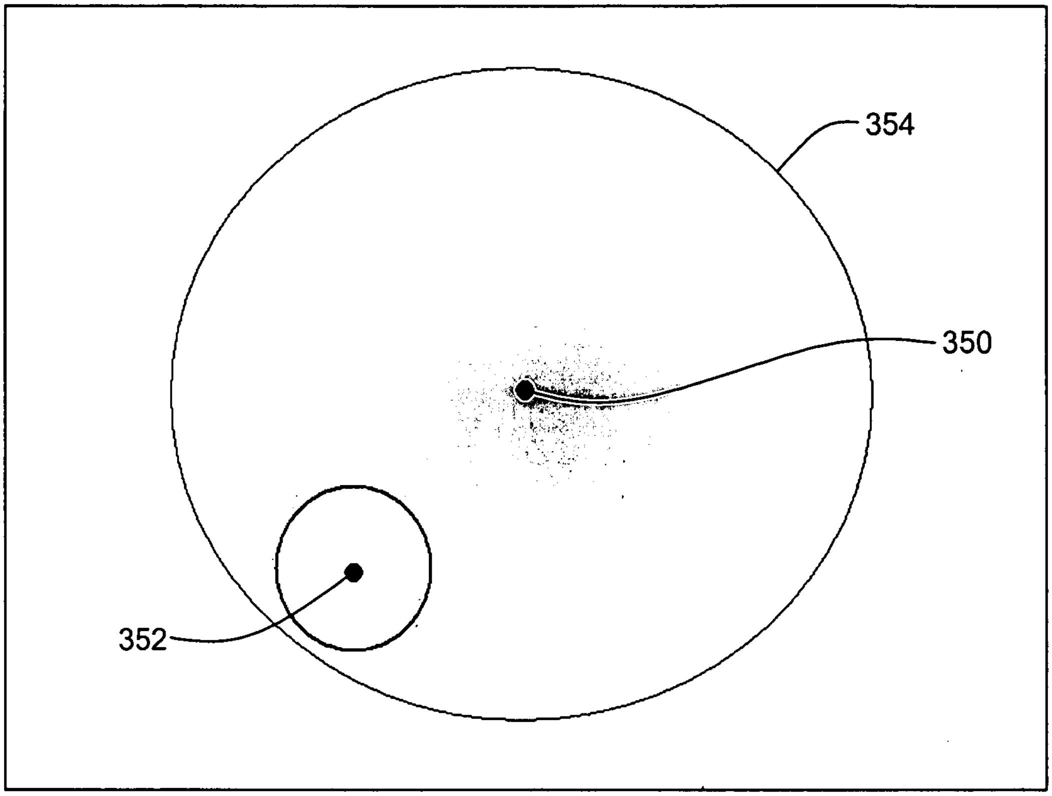

FIG. 3A

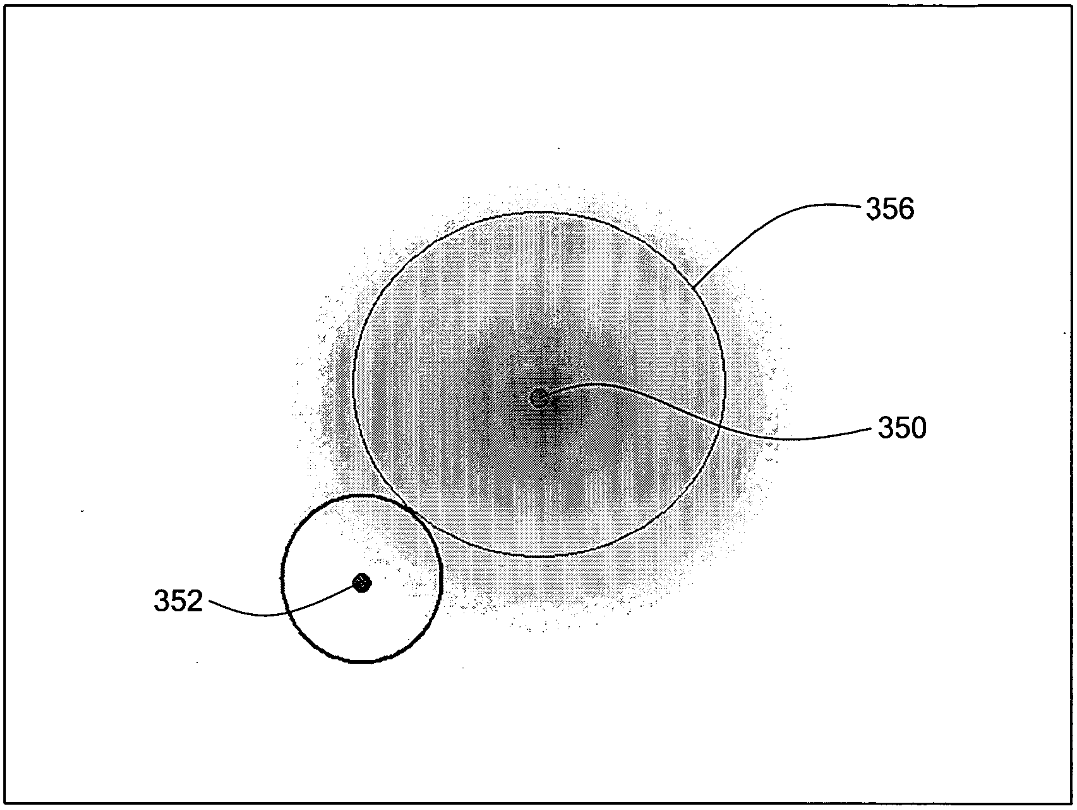

FIG. 3B

400

```
WHILE the stopping conditions given by Method Component 8 are not
satisfied
        DO Deterministic Tree Extension.
        DO Random Tree Extension.
        Set all leaf nodes that have not been extended in 3. or 4. to DEAD.
END WHILE

Deterministic Tree Extension

FOR each leaf node, N, that is not DEAD
        Apply Method Component 5 and obtain a set, X, of candidate path
extensions to N.
        FOR each candidate path extension, $\pi \in X$
                Apply Method Component 7 to determine if $\pi$ is feasible.
                IF $\pi$ is feasible THEN extend N by $\pi$.
        END FOR
END FOR

Random Tree Extension

WHILE Method Component 5 says to continue random extension
        Apply Method Component 5 to obtain a set, $\Lambda$, of candidate nodes
for random extension.
        FOR each node, $N \in \Lambda$, apply Method Components 5 and 6 to
obtain a set, X, of candidate path extensions
        to N.
        FOR each candidate path extension, $\pi \in X$
                Apply Method Component 7 to determine if $\pi$ is feasible.
                IF $\pi$ is feasible THEN extend N by $\pi$.
        END FOR
END WHILE
```

FIG. 4

300

```
1. Add the root node at your current position to T;
2. Obtain the current Turn Wedge from the VMM;
3. FOR each of #SN directions determined by  discrete uniform distribution In the Turn
        Wedge, attempt to extend in the direction;
4. END FOR;
5. IF it is not possible to extend in all #SN directions
6.         THEN choose at most #RA random directions within the Turn Wedge and attempt
           to extend in these directions until #SN extensions have been attained;
7. END IF;
8. WHILE (Stop Flag = = FALSE)
   Set Active Leaf List = New Leaf List;
   Set New Leaf List to Empty;
           FOR each Active leaf node, N, in T
           Attempt to extend straight ahead from N;
                   Attempt to extend towards the goal from N;
           END FOR;
           FOR each of the, at most, #RN Active leaf nodes having the best NM
           Obtain the current Turn Wedge from the VMM;
   Choose #RE random directions within the Turn Wedge and attempt to Extend in each of these directions;
           IF it is not possible to extend in all #RE directions
           THEN chose at most #RA random directions within the Turn
           Wedge and attempt to extend in these directions until #RE
           Extensions have been attained;
           END IF;
           END FOR;
           IF the Stop Condition has been met
                   Set Stop Flag = TRUE;
   END WHILE;
```

FIG. 5

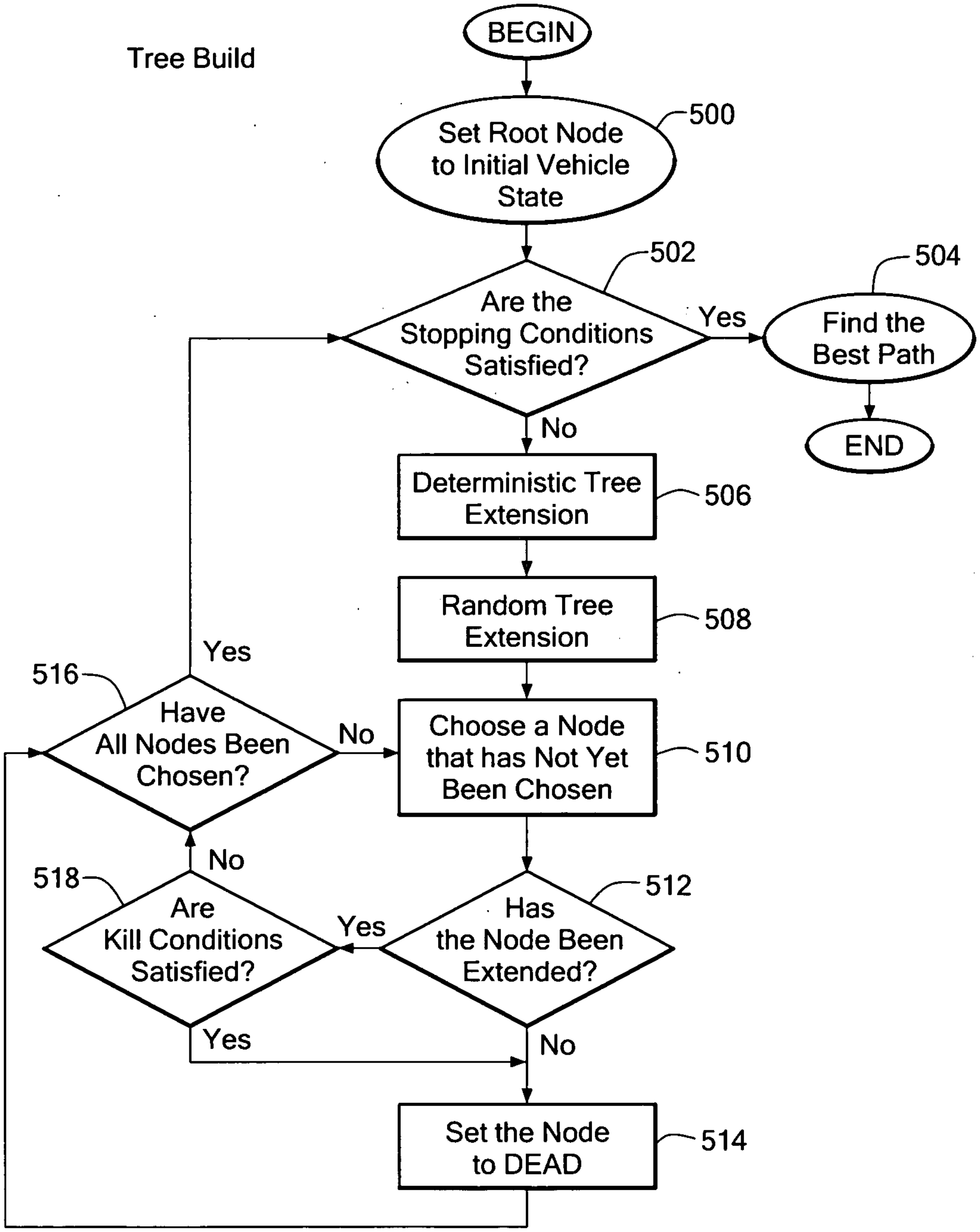
Tree Build
BEGIN
Set Root Node to Initial Vehicle State
500
Are the Stopping Conditions Satisfied?
502
Yes
Find the Best Path
504
END
No
Deterministic Tree Extension
506
Random Tree Extension
508
Choose a Node that has Not Yet Been Chosen
510
Has the Node Been Extended?
512
Yes
No
Are Kill Conditions Satisfied?
518
No
Yes
Have All Nodes Been Chosen?
516
Yes
No
Set the Node to DEAD
514

FIG. 6

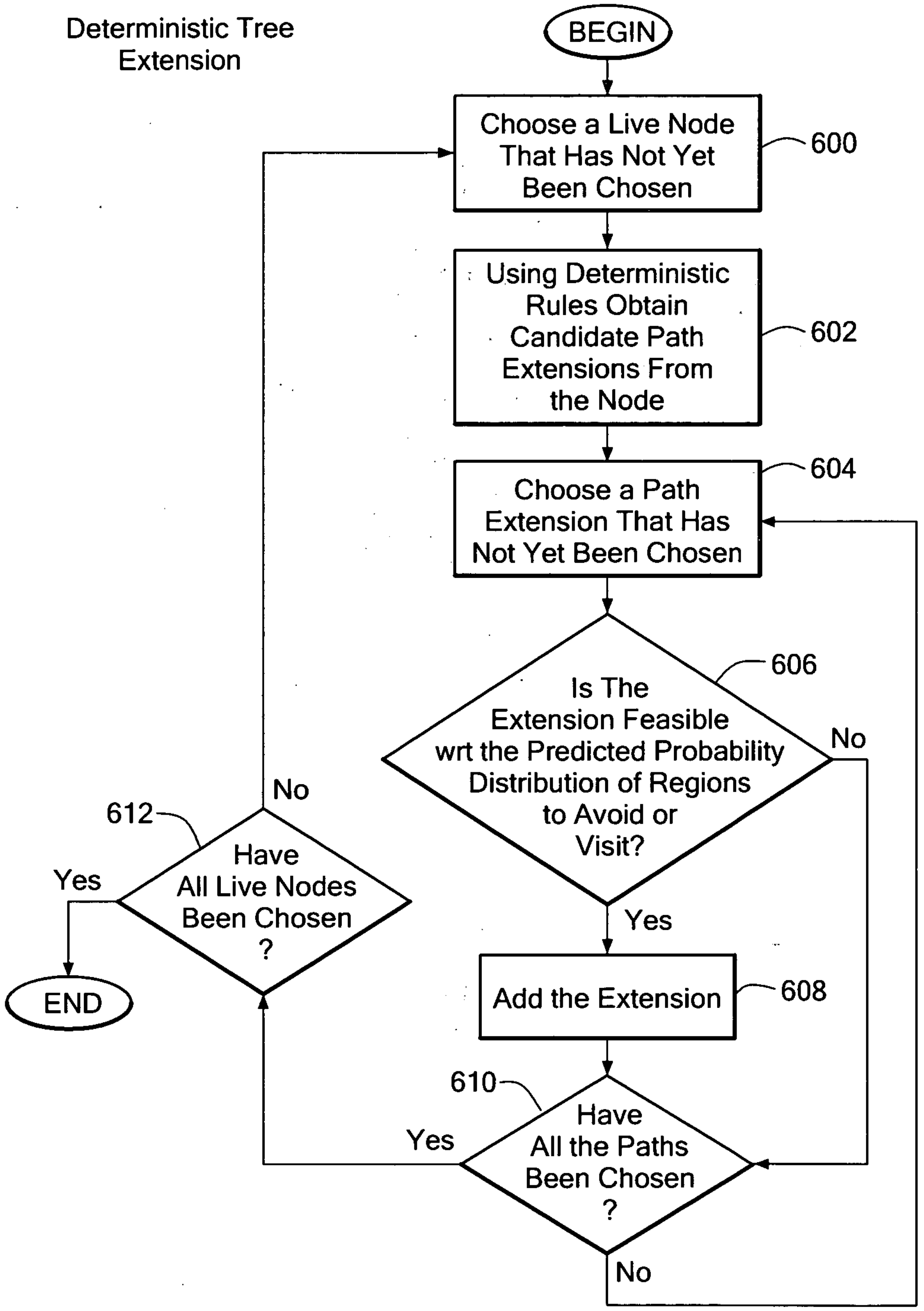
Deterministic Tree Extension
BEGIN
Choose a Live Node That Has Not Yet Been Chosen
600
Using Deterministic Rules Obtain Candidate Path Extensions From the Node
602
Choose a Path Extension That Has Not Yet Been Chosen
604
Is The Extension Feasible wrt the Predicted Probability Distribution of Regions to Avoid or Visit?
606
No
Yes
Add the Extension
608
610
Have All the Paths Been Chosen ?
Yes
No
612
Have All Live Nodes Been Chosen ?
No
Yes
END

FIG. 7

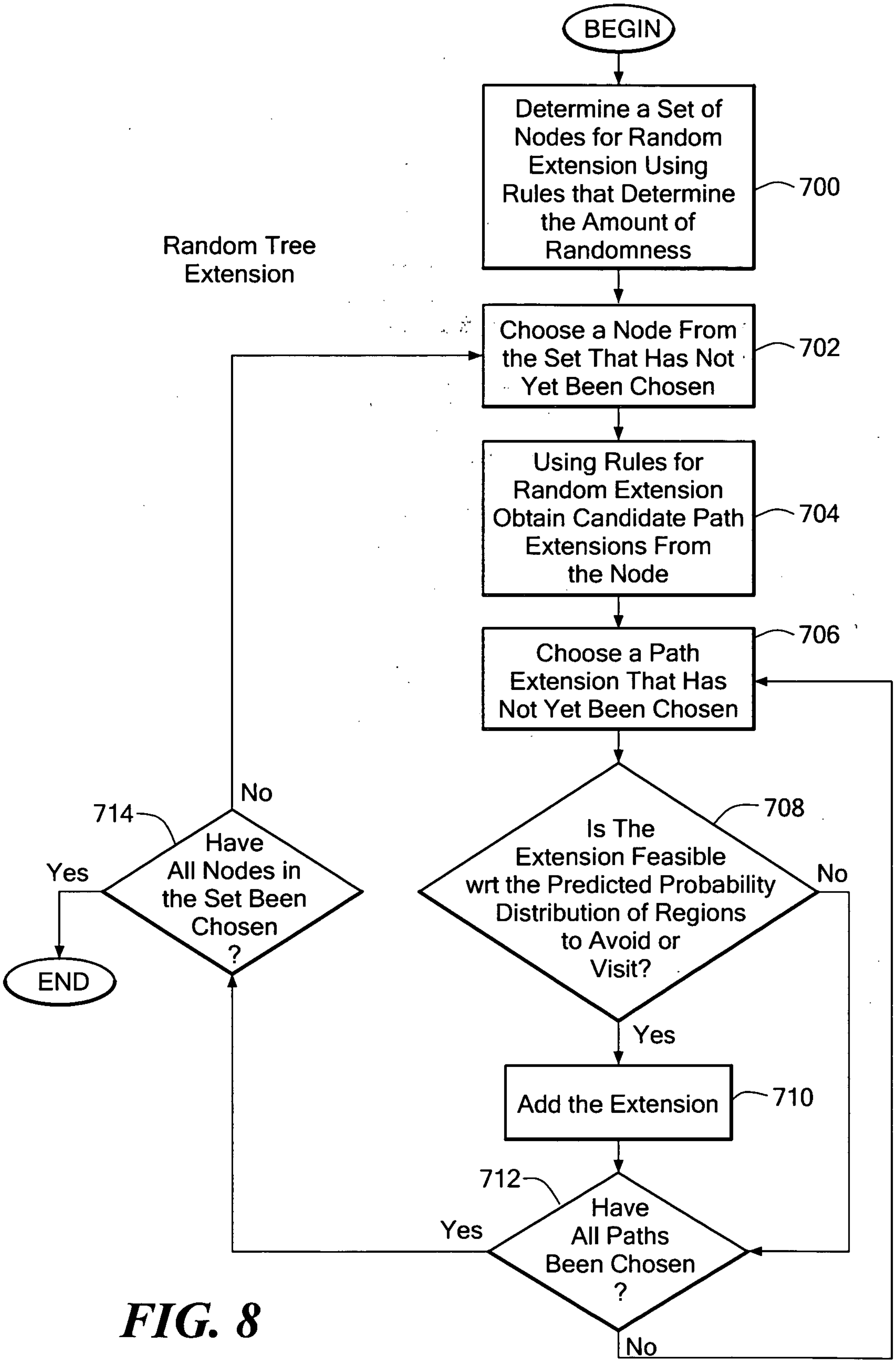
BEGIN
Determine a Set of Nodes for Random Extension Using Rules that Determine the Amount of Randomness
700
Random Tree Extension
Choose a Node From the Set That Has Not Yet Been Chosen
702
Using Rules for Random Extension Obtain Candidate Path Extensions From the Node
704
Choose a Path Extension That Has Not Yet Been Chosen
706
Is The Extension Feasible wrt the Predicted Probability Distribution of Regions to Avoid or Visit?
708
No
Yes
Add the Extension
710
712
Have All Paths Been Chosen ?
Yes
No
714
Have All Nodes in the Set Been Chosen ?
No
Yes
END

FIG. 8

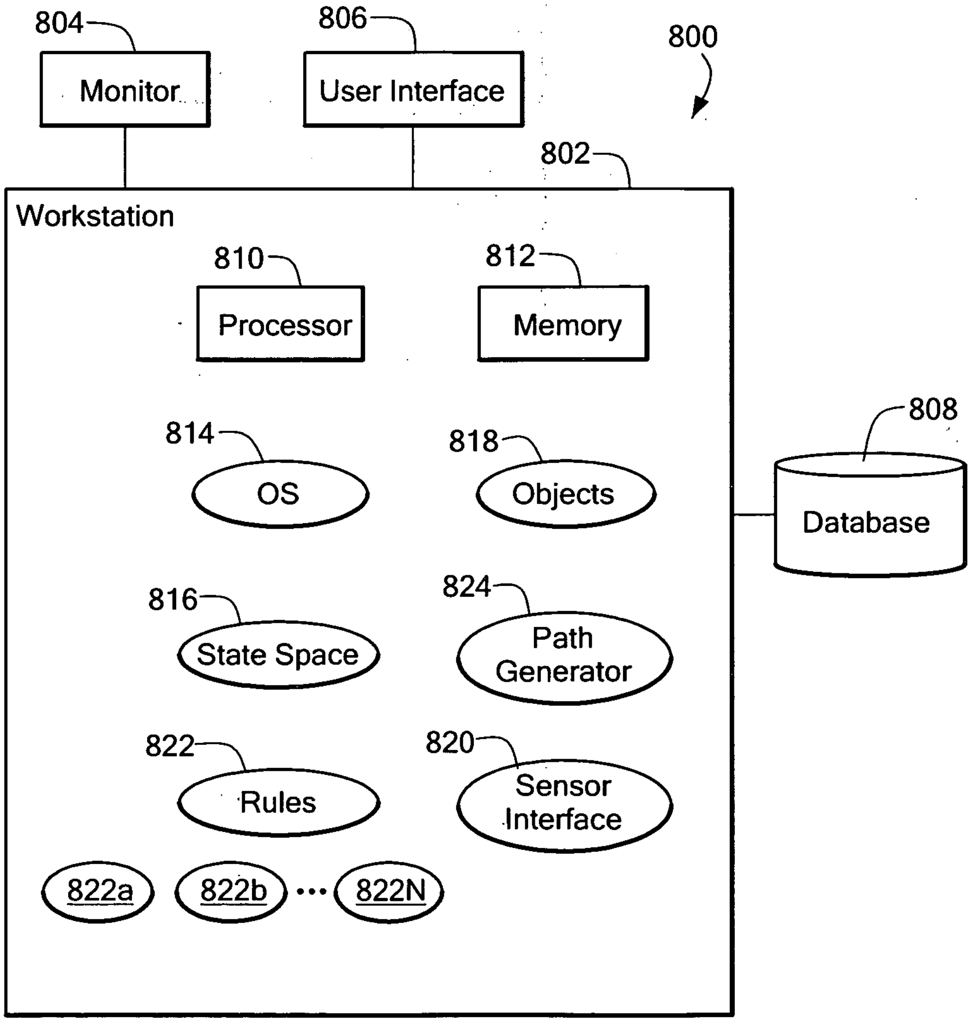
804
Monitor
806
User Interface
800
802
Workstation
810
Processor
812
Memory
814
OS
818
Objects
808
Database
816
State Space
824
Path Generator
822
Rules
820
Sensor Interface
822a
822b
822N

FIG. 9